

THE INFLUENCE OF LOW TEMPERATURE ON THE DEVELOPMENT OF
MICROORGANISMS. PART IV. THE INFLUENCE OF LOW
TEMPERATURE ON THE GROWTH OF MOLDS

by M. G. Gerasimov and Z. Z. Bocharova

FACILITY FORM 802

N66 33699

(ACCESSION NUMBER)

7
(PAGES)

(THRU)

(CODE)

(NASA CR OR TMX OR AD NUMBER)

04
(CATEGORY)

Translation of "Vliyaniye nizkikh temperatur na razvitiye
mikroorganizmov. IV. Vliyaniye nizkikh temperatur na
razvitiye plesnevykh gribkov".
Mikrobiologiya, Vol.VII, pp.838-42, 1938.

GPO PRICE \$ _____

CFSTI PRICE(S) \$ _____

Hard copy (HC) **\$1.00**

Microfiche (MF) **.50**

ff 653 July 65

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON MAY 1966

THE INFLUENCE OF LOW TEMPERATURE ON THE DEVELOPMENT OF
MICROORGANISMS. PART IV. THE INFLUENCE OF LOW
TEMPERATURE ON THE GROWTH OF MOLDS

*/838

F.M.Chistyakov and Z.Z.Bocharova

33699

The effect of temperatures of -8°C on the growth of various species and strains of mold on cold-storage meat and fish is discussed briefly, as a supplement to an earlier report. Tabulated data show that the delay in the appearance of visible growth is especially great shortly above the limiting temperature. Visible growth of *Chaetostylum Fresenii* appeared only after 13 months on wort-agar, whereas on fresh beef it appeared already 8 months after inoculation and placement in cold storage. *Thamnidium elegans* gave no growth on fresh beef in 12 months but showed visible growth on wort-agar with 20% sugar after 54 days. Longest (441 days) and shortest (54 days) delays were observed with *Oospora* sp. The data show that low temperatures affect different species and strains of molds differently and that -8°C does not constitute the lower limit for development of molds.

To supplement our previous paper (Bibl.1), we present in this note the results of observations from experiments of 1936 - 1937 and from new experiments started after October 1937.

During this period (October 1937 - June 1938) we found that molds started

* Numbers in the margin indicate pagination in the original foreign text.

to grow on slants of fresh beef in the freezer compartment at -8°C and in the Petri dishes on wort-agar, that had not been observed before. These molds had been transferred from products infected in cold storage: mutton (experiment No.99), beef (experiment No.100) and Beluga sturgeon (experiments Nos.96 and 98); see our other paper, p.511 (Bibl.1).

In experiment Nos.99 and 100, there were at first (on the days) such slight signs of growth that we decided not to record them. On the 231st day in experiment No.100 and to the 241st day in experiment No.99, when we were able to distinguish this growth reliably; in experiment No.100, on the 241st day, the colony diameter was 1 mm and on the 371st day, 4 mm; in experiment No.99, the diameter of the colony was 1.5 mm on the 251st day and 5.5 mm on the 371st day (Table 1).

Visible growth of *Chaetostylum Fresenii* transferred from Beluga sturgeon to a slant of fresh beef (experiment No.98) appeared at -8°C on the 251st day (Table 1).

On wort-agar (experiment No.96) after 12 months at -8°C , this mold gave no growth. However, in the 13th month, the first signs of growth appeared even here.

Thamnidium elegans (from the mold complex from cold-storage frozen mutton in the chamber at -5°C ; experiment No.107), gave no growth at -8°C on fresh beef after 12 months. On wort-agar with 20% sugar (experiment No.120) visible growth of this mold appeared at -8°C on the 54th day (Table 1).

The same was observed for *Oospora* sp. isolated from mash. This mash had been stored at -8°C for about 1.5 years in a locker of a Moscow cold-storage plant.

In experiment No.26, on wort-agar with 20% sugar, visible growth of this

TABLE 1

/839

DEVELOPMENT OF MOLDS AT -8°C

Name and Origin of Fungus	No. of Experiment	Medium	Time before Appearance of Visible Growth (in Days)	Diameter Increment of Colonies after Appearance of Visible Growth	
				Time (in Days)	Diameter (in mm)
Oospora sp. from mash in cold storage at -8°C	26	Wort-agar with 20% sugar	414	70	12
Oospora sp. from mash after 2 passages -5°C	119	Same	54	120	80
Chaetostylum Fresenii from Beluga sturgeon	96	Wort-agar	373	Growth only begins	
Chaetostylum Fresenii from Beluga sturgeon	98	Fresh beef	251	120	6.5
Undetermined species from beef "A"	93 ₁	Frozen mutton at -8°C	243	120	4
	93 ₂	Potato slants	274	100	5
	93 ₃	Wort-agar with 20% sugar	302	70	6
Undetermined species from frozen mutton "C"	111	Wort-agar	223	120	5
Undetermined species from frozen beef "A"	100	Fresh beef	125	250	4
Undetermined species from frozen mutton "B"	99	Fresh beef	124	250	5

/840

Name and Origin of Fungus	No. of Experiment	Medium	Time before Appearance of Visible Growth (in Days)	Diameter Increment of Colonies after Appearance of Visible Growth	
				Time (in Days)	Diameter (in mm)
Thamnidium elegans from frozen mutton	107	Fresh beef	No growth for 12 months	250	-
	120	Wort-agar with 20% sugar	54	120	48

mold appeared at -8°C only on the 414th day, while in experiment No.119 it already appeared on the 54th day on the same medium.

In both cases, the time to appearance of visible growth of this mold at higher temperatures (-5° , -2° , 0° , $+2^{\circ}\text{C}$) was very short, as indicated in Table 2.

In our first paper, we noted the particularly long delay of mold growth, slightly above the minimum growth temperature*.

The data in Table 2 show the same phenomenon. The mold whose visible growth appeared within a relatively short time at higher temperatures, showed initial growth at -8°C with a very long delay.

The 3° -interval between -5° and -2°C gives a delay of growth of 17 days in experiment No.26, while the same interval between -8° and -5°C retards the appearance of visible growth by 94 days.

In experiment No.99, visible growth appeared simultaneously at -5° and -2°C , while between -8° and -5°C the delay is 107 days, etc.

Returning to Table 1, we note that in some cases growth is very much retarded, as in experiment No.100 where after 250 days the colony diameter was

* The latter observation was also confirmed in a paper by Chistyakov and Noskova (Bibl.2).

TABLE 2

/841

TIME FROM INOCULATION UNTIL APPEARANCE OF FIRST SYMPTOMS OF
VISIBLE GROWTH IN SOME MOLDS AT VARIOUS TEMPERATURES

Name and Origin of Fungus	No. of Experi- ment	Expo- sure in Months	-18°C	-12°C	-8°C	-5°C	-2°C	±0°C	+2°C	+20°C
			Time in Days				Time in Days			
Oospora sp. from mash at -8°C	25	16	-	-	414	20	13	11	11	2
Undetermined species from frozen mutton "C"	111	11.5	-	-	223	77				
Undetermined species from frozen beef "A"	100	12	-	-	125	12	6			1
Undetermined species from frozen mutton "B"	99	12	-	-	124	17	17	4	3	1
Oospora sp. from mash at -8°C	119	6	-	-	54	23	13			3
Thamnidium elegans from frozen mutton	120	6	-	-	54	13				2

only 4 mm; in other cases, however, there were greater rates of growth, as in *Thamnidium elegans*, in which, in experiment No.120, the colony diameter attained 48 mm after 120 days.

Conclusions

The data presented in Table 2 demonstrate again that the delay in the appearance of visible growth becomes particularly great immediately above the minimum temperature of growth.

Analyzing the data of Table 1, we note that visible growth of *Chaetostylum Fresenii* (experiment No.96) appears on wort-agar only in the 13th month, while

on fresh beef it already appears 8 months after inoculation and placing in the cold-storage compartment. *Thamnidium elegans*, on the other hand, gave no growth on fresh beef after 12 months, while on wort-agar with 20% sugar, visible growth appeared on the 54th day.

In *Oospora* sp., on the same medium, however, visible growth in one case (experiment No.26) appeared on the 414th day, while in another case (experiment No.119), it already appeared on the 54th day.

All this again confirms the great difference in the effect of low temperatures on different molds and the insufficient clarity as to causes responsible for the greater or lesser suppression of mold growth at low temperatures; in addition, it appears that a temperature of -8°C is no guarantee against the development of molds.

BIBLIOGRAPHY

1. Chistyakov, F.M. and Bocharov, Z.Z.: Influence of Low Temperatures on the Development of Molds (Vliyaniye nizkikh temperatur na razvitiye plesnevykh gribkov). *Mikrobiologiya*, Vol.VII, No.4, 1938.
2. Chistyakov, F.M. and Noskova: Influence of Low Temperatures on Bacteria and Yeasts (Vliyaniye nizkikh temperatur na bakterii i drozhzhi). *Mikrobiologiya*, Vol.VII, No.5, 1938.

Microbiological Laboratory of the
All-Union Cold Storage Research
Institute, Moscow